FD Steering Kit Install Instructions
(Bump Steer Correction)

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Revision A

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Severability:

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Steering Kit Includes:

- 2x steering rack interface pieces
- 8x steering rack spacers (1/8” each, so up to ½” rack motion possible)
- 4x m10x1.25 bolts (rack connection)
- 2x Mazda tie rods to rod end adapter pieces (custom machined)
- 2x Aurora rod ends (aka heim joints, only branded bearings for us!)
- 2x Speedway Motors “pinto” steering rack spindles
    - Includes large and small nylocs and one large plain nut
- 2x Ronin spindle supports w/ 2x locking jam nuts.

Note: piece parts orders may only have part of these instructions applicable.

One side of each shown

Overview:

Surprise, surprise, the FD exhibits a ton of factory bump steer. Minds were blow when Ronin proved this in testing: https://youtu.be/tN4JNP2yN6c in case you missed it. However, it also left us scratching our heads a bit about where exactly folks might want to dial in their kits to. Would folks want it closer to racecar theoretically perfect, or do folks actually like some lively but less stable handling like that which Mazda used?

It's such a call on preference that--at least to start with--we decided to give folks full adjust-ability. We're giving you both the ability to shim the steering rack since you'll want this close to your oil pan--1/8” to 3/16" clear is a good target--and including adjustable Speedway Motors spindles.

One twist though... One of the few complaints about adjusting bump steer by shifting the ball joint lower (rod end sphericals in this case) is that it puts more load into the spindles. The Speedway spindles

are quite long. For rx7 applications, most folks will cut these down but still… A few folks have managed to bend spindles--both Samberg and Speedway--in off track adventures. As such, in addition to the pieces of a bump steer kit folks are used to we're also including a Ronin exclusive support piece. This effectively slides over the spindle hex and is tightened ONLY snug tight.

If your rod end is choked up high enough on the spindle that the support doesn't fit vs where the tie rod wants to be, then the added bending is small enough that you don't need the support.

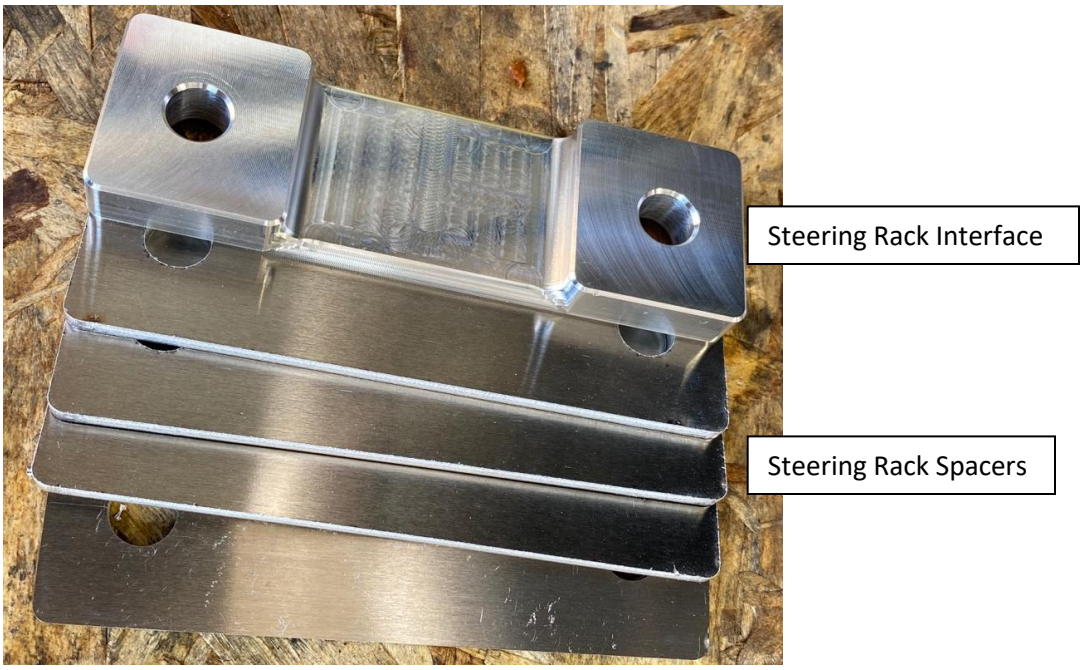
This kit needs at least 17" wheels, but even 17s may not allow as much adjustment range as desired. 18" wheels are typically recommended.

Installation Sequence:

1. Before you pull anything apart take note of your front ride height. Generally hub to fender line is pretty accessible. You can also measure frame to the ground and hub to the ground if that's easier to setup. Choose a reference and write it down.

2. Get the car on jackstands, remove wheels.

3. Set elevation on the steering rack. If you're starting with a rotary, there's no action required (your rack is located per factory specs). If you're using a Ronin subframe you need to use a rack interface piece and shims as required to locate the rack as high as possible relative to your engine of choice. Shims must be the same count left and right. The higher the rack the less steering correction that will be required.



Steering rack bolts torque to 33 ft lbs per factory specs.

4. Remove factory tie rod ends. A ball joint remover may be helpful. We like the lever style and generally press on the top of the ball joint stud with the castle nut flush to the top of the thread (just good practice to keep the end from deforming).

5. Test fit the spindle vs. wheels. We at Ronin question if part of the reason why the FD has so much factory bump steer was driven by the small 16" wheels. It is typical that the Speedway spindle will need to be cut down to clear wheels.

   Install the spindle to the tapered bore in the steering arm from below and torque the top nut snug tight (it may come on and off several times so the final torque should be done after the spindle is cut down).

It generally installs like the below. Pic at left from Speedway's website. Our comparable pieces at right (the spindle support is not shown).

6. Test fit wheels to get an idea of how much spindle will need to be cut. Mark your estimate directly on the spindle with sharpie. We recommend the spindle cutting occur AFTER some bump steer testing. It won't be helpful to dial in your bump steer with a position that you can't actually achieve with wheel clearance. However, after testing it's possible the you might decide larger wheels are in order.

7. Assemble all the pieces, however since we have several rounds of adjustment needed it is suggested that **the spindle support and its jam nut be omitted for now** so assembly is as above. The tie rod adaptor threads all the way down into the rod end bore. Tighten it all the way down then the remainder of tie rod including the Madza OEM jam nut may be used like normal.

8. Conduct a rough alignment. We need a baseline to measure from so the steering wheel is straight ahead and toe set somewhat close. Make sure the rack is centered, you can feel the tie rod inner joints inside the boots to double check and compare centering to the frame rails.

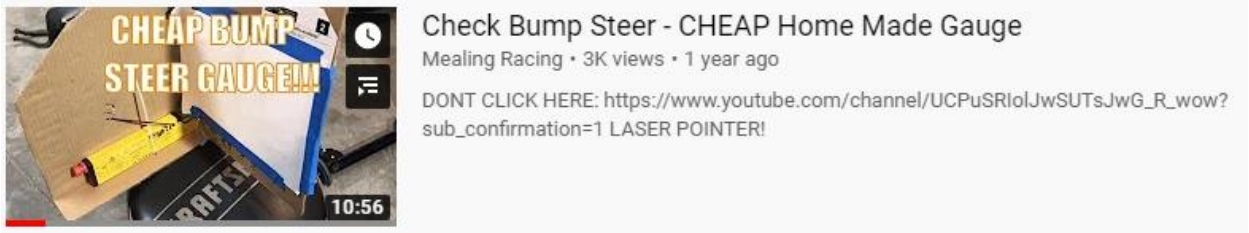
   Front toe you can set close to zero for now by sighting down the plane made by the front tire sidewalls and aiming this at the same surface on the rear tires.

   Note, toe will change with bump steer so there may be some iteration required.

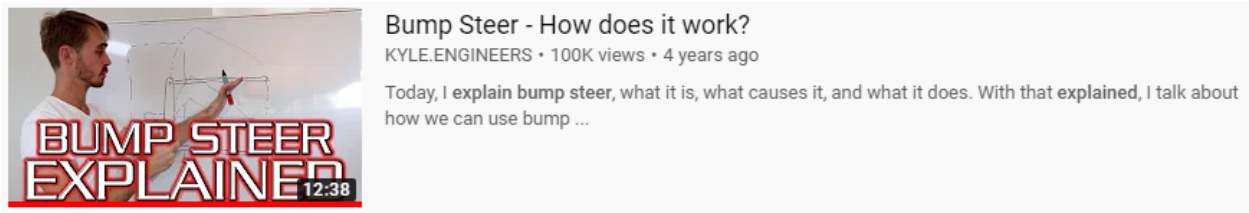
9. Dial in you bumpsteer correciton. There are two common methods: one uses a special tool with dial indicator to measure changes in toe throughout travel. The other uses a laser pointer and paper to look for the same changes but isn't as quantitative. There are a great many youtube tutorials out there but here's a few to get you started:

   Dial indicator method (method starts at 2:53) https://www.youtube.com/watch?v=7VuvPicStY4

   Laser pointer method: https://www.youtube.com/watch?v=oYoiq1GTrpI



   Good general information on bump steer: https://www.youtube.com/watch?v=_ilnd5wQEpg



   We generally want as close to zero as possible (see video links for detail), Ronin's test vehicle achieved a total bump of 0.008" in +/-1.5" travel from ride height. As point of reference we measured 0.130" compression and 0.160" in droop with the stock geometry over the same range.

   In terms of making adjustments I recommend Long Acre's excellent guide here: http://www.longacreracing.com/technical-articles.aspx?item=8162

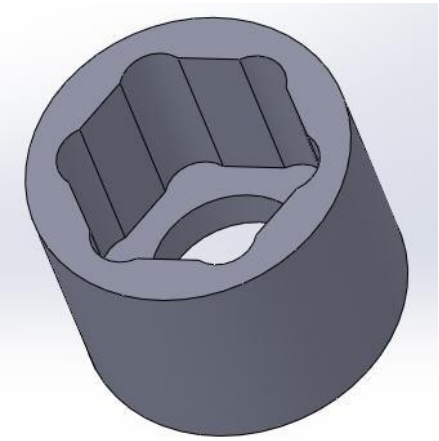
   Removing the entire shock is the easiest way to articulate the suspension.

   For our purposes we are trying to correct for the car's tendency to toe-in on compression. Lowering the outer tie rod pivot minimizes this. You'll want to keep relative measurements of the height you have the spindle set to at each test. I suggest calipers to measure between the bottom surface of the steering arm down to the nut above the spherical bearing.

When doing rough corrections you may find it's faster to not use all the hardware (as above)

10. Now that you know about what you're shooting for as elevation of the heim joint, next you need to decide whether or not to run the Ronin spindle support piece.

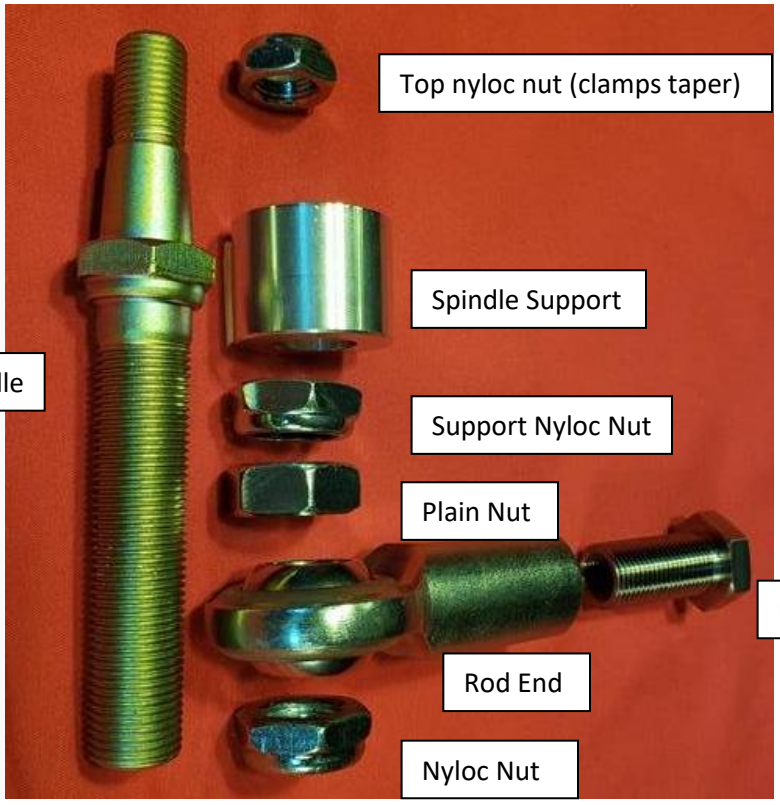
    One of the few complaints about adjusting bump steer by shifting the ball joint lower (rod end sphericals in this case) is that it puts more load into the spindles. The more extended you set your correction the more load you'll see. A few folks have managed to bend spindles--both Samberg and Speedway--in off track adventures. As such, in addition to the pieces of a bump steer kit folks are used to we're also including a Ronin exclusive support piece. This effectively slides over the spindle hex and is tightened **ONLY JUST SNUG TIGHT.**



WARNING! The Ronin spindle support piece has potential to be installed incorrectly!!!

In a typical Speedway Motor's bump steer application, you're using the supplied nuts to clamp top and bottom of the rod end/heim joint bearing race. This arrangement means that the clamp loads exists within specific sections of the spindle.

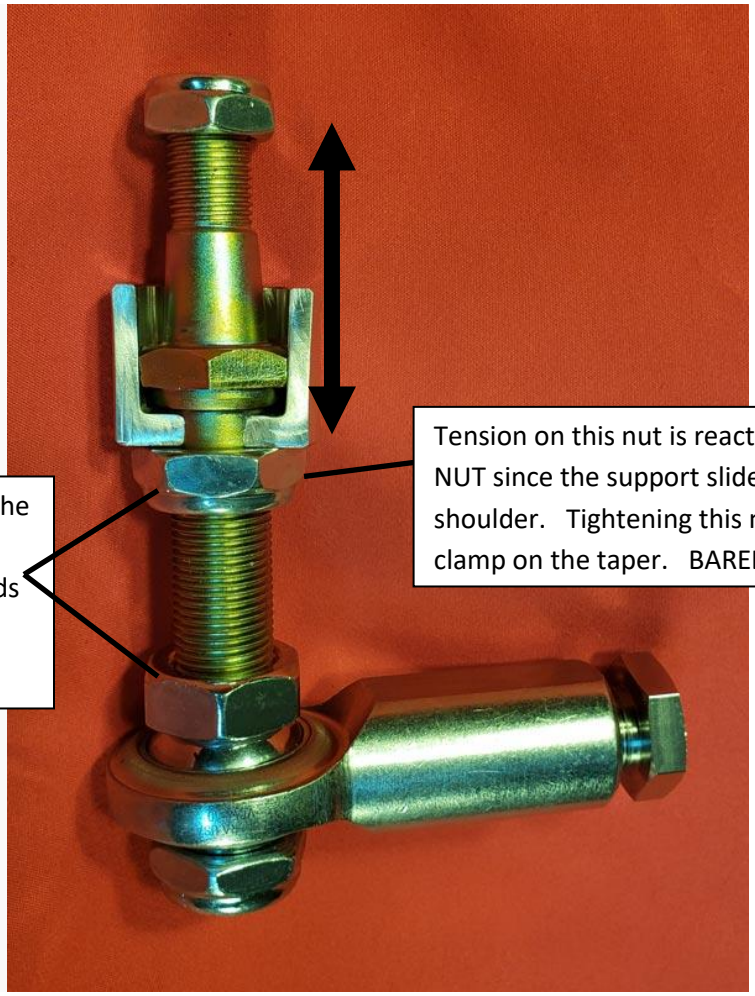
Compare the above to the full assembly sequence now including the support piece.



The support piece slides OVER the spindle's shoulder hex and instead engages the bottom surface of the steering knuckle. This gives a nice wide base supporting the bending load as it enters in the steering knuckle.

However, any load applied to the bottom of the spindle support part is being reacted at the knuckle's steering boss. If you crank down on the spindle support nut **you are is effectively trying to loosen the taper.** It's not a bad trick for removing the spindle but not what we want in operation.

This point is critical enough that we cut a support in half to makes sure it's understood.



It is critical that the spindle support use a dedicated nut tightened only barely snug tight. It is also critical that there are separate nuts clamping the spindle support and clamping the rod end. If you try to clamp the tie rod directly against the spindle support nut again we're taking load off the taper.

If you can't picture this load path and understand what I'm describing, then don't run the spindle support. Seriously, don't do it.

If your rod end is choked up high enough on the spindle that the support doesn't fit with 2 separated nuts vs where the tie rod wants to be, then the added bending is small enough that you don't need the support. If this is the case your stackup will be:

- Small nut up top clamping taper
- Mazda knuckle steering arm bore
- Plain nut above heim
- Heim joint spherical bearing
- Nyloc nut

That's the version that you probably did your test fitting with, subtle variation at right.

Last version…

Speedway Motors gives folks an alternate mounting style. If you prefer, you can source 5/8" cone spacers (https://www.speedwaymotors.com/Aluminum-Cone-Spacers-for-Rod-Ends-5-8-Inch,32679.html). This approach is intended to directly clamp the spacer stack against the hex shoulder in the spindle. In this case only the bottom most nyloc nut is used and the Ronin spindle support piece CANNOT be used.

Orient the spacers to maximize the travel of the spherical part of the rod end (small ends toward the ball). Example:

Heim joint bottom nut(s) clamp against spindle's protruding hex shoulder area. Ronin spindle support cannot be used.

11. Finalizing the setup.

    We're finally ready for the real install.

    - Excess length should be cut off the Speedway Motors spindle. Typically this is done with an angle grinder and cut off wheel. The tip should be slightly chamfered to maintain thread profile. It can be a good idea to cut the spindle with a nut upstream, then removing the nut following the cut helps to reform threads.
    - Recheck wheel fitment and be sure to spin the wheel to check for clearance of any wheel weights.
    - Install the cut down spindle. Top nut small jam nuts torques to **34 ft-lbs** and serves to clamp the taper. Make sure the taper is clean and dry. Check the mating knuckle bore for burrs or debris.
    - Install the Ronin Spindle support (assuming you'll be using it) it uses a large nyloc jam nut barely snugged. When you feel this touch down and START to snug that's the point to stop.
    - Install heim joint (rod end) to previously established height, probably a good idea to check bump one more time. It uses the plain nut above to set elevation and a second large nyloc nut below. The bottom most nut torques to **67 ft-lbs.**
    - Reinstall suspension, wheels, tires, etc.

12. Go get it properly aligned. Enjoy.

Good success and happy wrenching!

-Joel Payne
(for RSW)